

1 POWERED CUTTING SURFACE WITH PROTECTIVE GUARD FOR
2 EQUINE TEETH

3 **BACKGROUND OF THE INVENTION**

4 FIELD OF THE INVENTION

5 This invention relates to the art of tooth maintenance for
6 large animals and more particularly to a set of tools which may be used
7 under powered motion for care and maintenance such as removing a
8 selected portion of the exposed surface of teeth, such as equine teeth,
9 with the powered hand being guided into the mouth of the horse. The
10 powered tool is partially guarded so as to protect fleshy portions of the
11 horse's mouth from being engaged by the powered tool. The tool may
12 have a rotary cutting surface of a selected size and shape, sometimes
13 commonly called a burr, or the tool may be a rotary cut-off disk. The
14 selected tool, either the burr or cut-off disk, is supported and partially
15 enclosed in a protective guard formed as a hand piece that may be
16 guided into the mouth of a horse to perform care and maintenance on a
17 selected portion of the teeth. The hand piece fabricated according to the
18 teaching of this invention provides for quick on and off attachment of a
19 selected cutting surface for maintenance of a preselected portion of teeth
20 within the same hand piece or another hand piece sized to ease access to
21 the next selected portion of the horse's mouth. The selected cutting
22 surface is mounted within the protective guard/hand piece arrangement
23 that may further incorporate a vacuum channel whereby the tooth dust
24 and debris created by the powered cutting surface removing a portion of
25 tooth is sucked out of the mouth of the horse. The motion of the tooth
26 surface removal tool may be changed from rotary to powered
27 reciprocating motion for a selected portion of the teeth. Attaching the
28 powered drive to the rotary cutting surface by means of an adjustable
29 clutch further enhances protection from injury to the inside of the
30 mouth of the horse.

1 DESCRIPTION OF THE PRIOR ART

2 Throughout the life of the horse, the teeth continue to
3 extend from the gums. When non-domesticated horses graze on the
4 ground, they pick up sand and hard particles in the grass, which would
5 naturally reduce the growth of the horse's teeth.

6 In order for domesticated horses to properly chew their food,
7 which consists mostly of preprocessed grain and formula, the teeth
8 require periodic maintenance. Without the natural wearing of the teeth
9 from grazing on the ground, the teeth may grow uneven and too long,
10 thus interfering with normal eating.

11 In the past, regular dental care to remove points, hooks or
12 ridges that have grown or worn into the teeth required the use of a
13 specially designed rasp-like tool to remove them, a process called floating
14 the teeth. Because of the structure of the teeth, the horse does not have
15 nerves extending upward in the teeth and therefore feels no pain when
16 the teeth are filed to reshape them.

17 A grown horse uses 36 teeth to eat. The 6 upper incisors
18 and the 6 lower incisors are for shearing grass and leaves, which are
19 masticated by 12 premolars, and 12 molars located on both sides of the
20 upper and lower jaws. These molars must align for the horse to chew
21 properly.

22 The majority of dental problems are associated with the
23 molars and premolars. However, if the incisors are too long, opposing
24 molars and premolars may be prevented from engaging properly.

25 In the prior art, hand tools similar to metal files or rasps
26 were used to remove a selected portion of the tooth surface. These tools
27 consisted of several shaped handles with pads mounted on one end.
28 The pads accepted plates having an abrasive or specially designed file or
29 rasp-toothed surface selected by the user. The mounted abrasive or
30 rasp on the handle was then inserted into the horse's mouth and

1 positioned against the tooth structure that needed to be altered. The
2 user then manually applied pressure and movement to the handle until
3 the selected portion of the tooth structure was removed.

4 Some prior solutions to the problem were to add motor
5 power to the burrs to provide a "power dental tool" to replace the manual
6 rasps. These solutions ease the manual work but introduced other
7 problems such as the uncontrolled creation of dust and debris as well as
8 the danger of injury to the horse and user from exposed high speed
9 reciprocating or rotary burrs or rasps which may engage soft tissue such
10 as the cheek, tongue, or gums inside the horses mouth.

11 Thus, there has long been a need for an arrangement that
12 allows the user, usually a veterinarian, an owner or an equine dentist, to
13 easily perform the removal of preselected material from the exposed
14 surface of the horse's teeth without danger to the horse or the person
15 doing the job.

16 It is desired that the arrangement allow the user to access
17 the full array of teeth with a set of preselected shaped and surfaced files,
18 rasps or other tools such as diamond cut-off blades.

19 It is further desired that the arrangement be motor driven
20 but provide safety to the user and horse.

21 It is further desired to provide preselected shaped covers or
22 guards around selected portions of the rotary tool to allow the system to
23 be used in all parts of the mouth of the horse.

24 It is further desired to provide a clutch between the motor
25 and the rotary tool. The threshold of disengagement of the rotary power
26 applied by means of the clutch may be adjustable with access for
27 adjustment that does not require dismantling the system.

28 It is further desired that the arrangement be able to remove
29 accumulation of debris from the inside of the horse's mouth during the
30 procedure.

1 It is desired that a simple latching or unlatching movement
2 engage and disengage the selected tool within the rotary driven
3 arrangement.

4 It is desired that a simple latching or unlatching movement
5 engage and disengage selected guards around the rotary tool.

6 It is further desired that during the operation of the
7 arrangement for the removal of material from inside the mouth the
8 inadvertent engagement of soft tissue inside the mouth not adversely
9 affect the user or the horse.

10 It is desired that reconfiguration of the arrangement be
11 accomplished even if the users hands are slippery.

12 It is further desired that the motor be separated from the
13 rotary tool by a drive train so that the user need not support the weight
14 of the motor during the procedure.

15 It is further desired that the arrangement be easily adapted
16 to a "power dental tool" motor or handle the user may presently own.

17 SUMMARY OF THE INVENTION

18 Accordingly, it is an object of the present invention to
19 provide an arrangement that allows the user to safely and easily perform
20 a dental procedure of removal of preselected material from the exposed
21 surface of the teeth of horses.

22 It is another object of the present invention to provide an
23 array of preselected size, shape and surfaced tools to be used to remove
24 the tooth material as well as a means for quickly changing the rotary tool
25 selected and provide a guard around a selected portion of the rotary tool
26 so that it does not engage the flesh inside the mouth of the horse.

27 It is an object of the present invention to provide a
28 clutch arrangement which allows the user to initially adjust the
29 threshold at which the rotary motion will disengage should the rotary
30 tool inadvertently entangle flesh inside the mouth of the horse. It is a

1 further object that said threshold may be easily changed as the
2 procedure progresses among various portions of the mouth without
3 dismantling the system.

4 It is another object of the present invention to provide a
5 method of removal of the tooth material debris from inside of mouth of
6 the horse without stopping or interfering with the progress of the
7 procedure.

8 It is yet another object of the present invention to provide an
9 arrangement which does not require the user to support the motor
10 during the procedure.

11 It is yet another object of the present invention to be easily
12 mountable on or at least partially adapted to a "power dental tool" which
13 may be currently owned by the user.

14 The above and other objects of the present invention are
15 achieved, according to a preferred embodiment thereof, by providing a
16 system of an improved power tool arrangement of a motor, power train,
17 tools that remove tooth material, rotary tool hand pieces which support
18 the tools for rotary motion or reciprocating motion and provide a guard
19 to separate the tool from soft tissue. The arrangement is provided with
20 means to easily reconfigure the tool, tool support and guard to adapt the
21 system for powered removal of preselected portions of teeth.

22 MOTOR

23 The power for the preferred arrangement may be supplied
24 from a preselected off the shelf rotary hand tool that may be obtained in
25 various configurations of torque and adjustable rpm under the
26 trademarks DREMEL or SUHNER. Each motor is designed to accept the
27 shaft of a tool with an arrangement of a collet. The tool may have a
28 selected cutting surface and a selected length of shaft. The rotary hand
29 tool may be enhanced with a flexible shaft, one end adaptively
30 mountable on the rotating shaft of the motor and the remote end

1 attachable to an optional handle whereby under the condition of the
2 rotary tool being mounted on the handle, the user may perform work by
3 directing the rotary tool remote from the motor without having to
4 support the weight of the motor. The motor may be supported within a
5 backpack, fannypack or sling arrangement worn by the user.

6 POWER TRAIN

7 The flexible shaft that may be mounted between the motor
8 and the tool removes the burden of holding the motor and physically
9 separates the motor from the tool thereby diminishing the level of sound
10 of the arrangement that may be disturbing to the horse. One end of the
11 flexible shaft may incorporate an adapter for quick push on connection
12 with the selected motor, the end attachable to the hand piece may be
13 fabricated with a stainless steel sleeve and shaped to incorporate a catch
14 engagable with a latch mounted on the hand piece. The length of the
15 flexible shaft may be selected to provide easy movement of the end of the
16 shaft remote from the motor.

17 However, the flexible shaft arrangements provide direct
18 coupling between the motor and the rotary tool. Should the tool engage
19 a portion of the soft flesh inside the mouth of the horse or bind against
20 the surface of the teeth, the rotational energy of this direct connection
21 may cause damage to the horse before the tool can be removed or the
22 power disconnected from the motor. In the present invention an adapter
23 is provided between the motor and the flexible shaft. An adjustable
24 clutch is mounted within the adapter to be accessible to the user to
25 adjust the threshold of torque transmitted between the motor and the
26 flexible shaft of the power train. Should the tool bind, as soon as the
27 selected threshold is exceeded, the movement of the power train is
28 interrupted so that the user may safely disengage the tool or clear the
29 obstruction thereby providing protection to the horse and user of the
30 arrangement.

1 TOOL

2 It is possible to obtain off the shelf tools to which rotary
3 motion is applied. The tool is mountable in the motor and generally
4 consists of a shaft and a working surface mounted on the end of the
5 shaft. The shaft is nominally no longer than 1 to 2 1/2 inches. The
6 working surface is provided in an array of shapes, sizes and surfaces.
7 Some of the preferred shapes include a sphere, cone, cylinder, and
8 combinations such as cylinder topped by a half sphere. These tools may
9 be commonly called a burr. The cutting surface formed in the tool may
10 be a preselected pattern of raised rasp like teeth of a preselected size and
11 shape which removes tooth material without binding, bouncing or filling
12 the rasp like teeth with debris.

13 Another type of rotary tool is the cut-off disk which is a
14 platter about the size of a quarter covered with diamond dust and
15 mounted on a shaft. This disk may be used edge on to cut off a selected
16 portion of a tooth rather than grind off the portion with a burr. The edge
17 of the disk may also be used to score the selected portion of tooth so that
18 portion may be chipped off. The flat surface of the disk may be used as
19 a polishing tool or may be used to round off any sharp edges like a disk
20 sander.

21 If a tool having a working surface is mounted within a collet
22 either on the end of the motor or on the end of the handle attached to
23 the motor or end of a flexible drive shaft and the rotary tool has a shaft
24 length of more than approximately 2 1/2 inches, the operation of this
25 configuration of an extended cutting surface rotating at high speed and
26 fully exposed, may be dangerous to the user and to the work piece, in
27 this case the mouth of a horse. The mouth of a horse is deep and
28 requires a tool of at least 12 inches in length to adequately reach the
29 exposed surface of the back molars.

30

1 GUARD (Safety shield/hand piece) AND ROTORY TOOL
2 SUPPORT (with vacuum channel)

3 A guard in the form of an encircling shield may be installed
4 around the tool's shaft and cutting surface to separate the user and
5 portions of the horse's mouth from the tool which is in rotary motion.
6 The guard should be fabricated to have a minimal opening to allow only
7 a selected portion of the cutting surface to be exposed. The hand piece,
8 mountable on the end of the motor or flexible shaft, may be fabricated to
9 incorporate the guard in a manner that allows the tool to be mounted
10 within a channel of the hand piece thereby supporting the shaft and
11 encircling the cutting surface. Support of the shaft is generally required
12 if the shaft of the tool is longer than approximately 4 inches in order to
13 reach into all areas of the mouth of the horse, pressing the cutting
14 surface onto the surface of the tooth may move the shaft and or cutting
15 surface against the safety shield or channel of the handpiece. Bearings
16 may be mounted at preselected positions along the channel to support
17 and protect the rotating shaft and cutting surface under conditions of
18 engaging the channel or guard surfaces.

19 The hand piece may be supplied as a set of selected lengths
20 specially adapted to service a selected portion of the horse's mouth. A 6
21 to 8 inch hand piece may be used to service the incisors. A 12 to 14
22 inch handpiece may be used for the back molars. An 8 to 12 hand piece
23 may be supplied for intermediate service whereas a 10-inch hand piece
24 is the recommended length for an all around arrangement.

25 The hand piece may include a second channel partially
26 separate from the rotary tool channel. The hand piece may be
27 fabricated to form an orifice near the cutting surface whereby the orifice
28 is in communication with the second channel. The end of the second
29 channel remote from the cutting surface is attachable to a vacuum
30 source such as a "SHOP VAC" ® whereby tooth material removed by the

1 cutting surface may be sucked out of the mouth of the horse along the
2 second channel without having to remove the hand piece from the
3 mouth of the horse.

4 The hand piece may also incorporate appropriate gearing
5 and joints to transpose the rotary motion of the motor and apply a
6 reciprocating motion to the tool mounted on hand piece. The
7 reciprocating tool usually contains a textured surface to remove tooth
8 material especially from the rear most molars which so abuts the gum of
9 the horse that the use of a rotating tool even with a guard may cause
10 injury to the gum.

11 In the preferred embodiment, the incorporation of an
12 adjustable clutch within the power train, mounting of at least one
13 support bearing within the handpiece, mounting the rotary tool with a
14 guard and further providing for the mounting of shaped guard
15 extensions on the surface of the guard provides a quick reconfiguration
16 of the arrangement during the procedure that provides care and
17 maintenance for the entire set of teeth.

18 An adapter may be provided to allow the user to use at least
19 a portion of the arrangement such as the tool handpiece and guard
20 system with a power dental device already owned by the user.

21 BRIEF DESCRIPTION OF THE DRAWINGS

22 The above and other embodiments of the present invention
23 may be more fully understood from the following detailed description,
24 taken together with the accompanying drawings, wherein similar
25 reference characters refer to similar elements throughout, and in which:

26 Figure 1A, B, C, D and E are front views of the present
27 invention;

28 Figure 2 is a front view of a bearing support;

29 Figure 3 is a front view of another bearing support;

30

1 Figure 4 A, B, C, and D are views and a cross section of the
2 present invention;

3 Figure 5 A, B, and C are views of another embodiment of the
4 present invention;

5 Figure 6 B and F are views of another embodiment of the
6 present invention, Figure 6 H is a view of the hose;

7 Figure 7 B and F are views of a flange;

8 Figure 8 is a cross sectional view of the present invention;

9 Figure 9 is a cross sectional view of the present invention;

10 Figure 10 is a front view of the bearing support;

11 Figures (originally just 11 but the drawing had 11 and
12 11F)11 (is) and 11F are a view of another embodiment of the present
13 invention, Figure 11 E is a view of the extended shaft;

14 Figure 12 (originally F, B and S then changed to changed to
15 Front, Back and Side and finally to X, Y and Z) X, Y and Z and A, B, C
16 are views of another embodiment of the present invention ;

17 Figure 13 is a view of an attachable handle;

18 Figure 14 is a view of another embodiment of the present
19 invention;

20 Figure 15 is a detailed view of another embodiment of the
21 present invention;

22 Figure 16 is a schematic of the power train; and,

23 Figure 17 is a view of the clutch arrangement.

24 DESCRIPTION OF A PREFERRED EMBODIMENT

25 Referring now to the drawing, there is illustrated in Figures
26 1A through 1E an embodiment of an arrangement fabricated according
27 to the teaching of the present invention and generally designated 10.

28 Figure 1A illustrates a rotary tool support generally designated 301
29 mountable within a hand piece generally designated 401. The hand

1 piece 401 is fabricated to form a guard around a selected portion of the
2 cutting surface 302. This embodiment is adapted to be attachable to a
3 motor directly or by means of a flexible shaft and/or a handle that the
4 user may own.

5 The rotary tool support 301 illustrated in Figure 1A is
6 fabricated to support the shaft 303 of the rotary tool with a cutting
7 surface 302 mounted on the shaft 303, even if a long shaft 303 (greater
8 than 6 inches) is used.

9 Now referring to Figure 1C, the hand piece 401 fabricated
10 according to the principals of the present invention incorporates the
11 base 403 which may be fabricated to adapt the arrangement to a
12 powered rotating source, such as a flexible shaft which is engage with
13 the shaft 303, or be mountable directly on the end of a powered rotating
14 source already owned by the user. The end of the hand piece 401
15 remote from the powered rotating source is fabricated as a guard
16 encircling a selected portion of the cutting surface 302 and may accept
17 the mounting of an extended guard 406. The long shaft 303 of the
18 rotary tool is required so that the arrangement may be used to reach
19 even the rear most teeth within the mouth of the horse. The shape of
20 the extended guard 406 may be selected to protect a particular portion of
21 the horse's mouth and thus may form a set of removable attachable
22 guards.

23 Now referring to Figure 1 A, there is illustrated a rotary tool
24 support generally designated 301. The rotary tool mounted with the
25 support 301 has a cutting surface 302 mounted on a shaft 303, this
26 illustrated combination is commonly known as a burr. The shaft 303
27 extends along a bearing support sleeve 304. In the preferred
28 embodiment, a bearing 305 is press fit into the end of the sleeve 304
29 nearest the cutting surface 302. An upper shaft seal 306 is mounted

1 above the bearing 305. A lower shaft seal 307 may be mounted on the
2 end of the shaft 303 remote from the cutting surface 302 to protect the
3 bearing 305 from contamination. Figure 1 B shows the rotary tool
4 support 301 fully assembled.

5 Figure 1 C illustrates a hand piece generally designated 401.
6 An outer shell fabricated of a capped tube 402 is mounted into an
7 adaptive base 403 having a plurality of setscrews 405 depicted as an
8 upper pair 405U and a lower pair 405L. The diameter of the tube 402 is
9 selected to be a snug fit for the fully assembled rotary tool support 301
10 but allow the tool support 301 to be easily inserted into or removed from
11 the tube 402. A selected upper portion of the tube 402 is removed down
12 to the lower edge 404 to form an opening and expose a selected portion
13 of the cutting surface 302. The remainder of the outer shell capped tube
14 402 forms a shield around the cutting surface 302. If more protection is
15 desired an external guard 406 of preselected shape may be slid over the
16 end of the tube 402 and secured in place with a set screw 405. The
17 shape of the external guard 406 is selected so as to not come into
18 contact with the cutting surface 302. Walls 407 form an opening in the
19 external guard 406 to expose a preselected portion of the cutting surface
20 302.

21 Figure 1 D illustrates the rotary tool support 301 fully
22 inserted into the hand piece 401 and secured lightly therein by the
23 upper pair of setscrews 405U. The end of the shaft 303 remote from the
24 cutting surface 302 is mounted into the collet 202. In this embodiment,
25 the collet 202 is mounted on the end of a flexible shaft handle 203,
26 which may be mounted to a motor. The adaptive base 403 is installed
27 over the flexible shaft handle 203 and tightly secured in place by the
28 lower pair of setscrews 405L followed by tightening the upper pair of set
29 screws 405U. Figure 1 E shows the exposed portion of the cutting

1 surface 302 surrounded by the hand piece 401 and external guard 406
2 fully assembled.

3 The external guard 406 may be fabricated with second wall
4 409 forming an intake orifice 410 at a preselected position near the
5 cutting surface 302. A vacuum channel 408, which in the preferred
6 embodiment is a hollow tube, may be mounted or fabricated within the
7 external guard 406, positioned essentially parallel to the handpiece 401
8 and in communication with the orifice 410. As the channel 408 has one
9 end making a connection with the intake orifice 401 formed by second
10 wall 409, the channel 408 provides an open passage way for sucking out
11 dust and debris created during use of the cutting surface 302 upon the
12 condition of a vacuum source attached to the end of channel 408 remote
13 from the intake orifice 410.

14 In Figure 2 there is illustrated another embodiment of the
15 rotary tool support 301 fabricated as above with the addition of a lower
16 bearing 308 mounted within the bearing support sleeve 304 above the
17 lower shaft seal 307. However, when the shaft 303 in such a multiple
18 bearing arrangement is mounted within the collet 202 of the flexible
19 shaft handle 203, should the flexible shaft handle 203 also be fabricated
20 with a multiple bearing arrangement, a misalignment of the bearings of
21 the flexible shaft handle 203 and the bearings supporting shaft 303 may
22 occur to cause excessive wear on one or more of the bearings or may
23 cause the arrangement to bind and not be smoothly rotatable by the
24 motor. This binding may be overcome by providing a means to adjust
25 the alignment of the bearings.

26 If the lower bearing 308 and external seal 307 are removed
27 to overcome any binding problem then another problem may develop.
28 During use of the arrangement, the end of the bearing support sleeve
29 304 remote from the cutting surface 302 may come into contact with the

1 collet 202 causing excessive wear to the point that the collet 202 cannot
2 be loosened for the removal of the shaft 303.

3 Figure 3 illustrates a solution. The use of a lower bearing
4 308 and lower seal 307 can be eliminated and damage to the collet 202
5 be avoided by mounting a hollow brass tube 309 onto the shaft 303.
6 Upon the mounting of the shaft 303 into the collet 202, the end of the
7 brass tube 309 may be positioned to be spaced apart from the collet 202
8 or in contact with the collet 202. However the end of the sleeve 304
9 should not be in contact with the collet 202. The brass tube 309
10 extends from below the upper bearing 305 to a selected distance, 1/16
11 to 1/8 inch, below the end of the bearing support sleeve 304 remote
12 from the upper bearing 305. Upon use of this arrangement, the brass
13 tube 309 performs the function of a bearing by allowing the remote end
14 of the sleeve 304 to come into contact with the brass tube 309 but the
15 brass tube 309 keeps the sleeve 304 separate and apart from the
16 rotating shaft 303.

17 Figure 4 illustrates a specialized handpiece 402 fabricated
18 according to the teachings of this invention to incorporate a first channel
19 for the support for the shaft 303 of the selected rotating tool, a guard
20 partially encircling the tool mounted on the shaft and a second channel
21 which may be attached to a vacuum source. This arrangement generally
22 designated 401 and is fabricated to directly attach to a preferred motor
23 by means of a flexible shaft. The rotating tool illustrated as mounted in
24 the handpiece 402 is a diamond cutoff disk 310 mounted on the end of
25 shaft 303. In the preferred embodiment, the center of the disk is welded
26 to the shaft rather than attached to a shaft by a screw or bolt. This
27 arrangement creates a flat surface on the topside of the disk and is
28 preferred for polishing, as it does not have any high points. The disk
29 310 may be used in this arrangement to slice off a portion of a tooth
30 rather than grind off the portion with a cutting surface known as a burr.

1 The partial cutaway view in Figure 4 B illustrates the end of the shaft
2 303 remote from the disk 310 to be removably insertable within the
3 bearing support sleeve 304 through the bearing 305. The shaft 303
4 may be further protected by a hollow brass tube 309. A connector 311
5 attaches the end of the shaft 303 remote from the disk 310 to an adapter
6 312 which is adapted to slip directly into the end of a motor driven
7 flexible shaft that compatible with the selected motor obtained under the
8 trademark SUHNER. Another preselected shaped adapter 312 may be
9 mounted to the connector 311 to facilitate easy connection to a flexible
10 shaft compatible with the DREMME[®] motor. A latch 413 may be
11 mounted on the handpiece 402 engagable with a catch formed on the
12 end of the flexible shaft to hold the end of the flexible shaft within the
13 hand piece 402. The illustrated hand piece 402 may be re-configured by
14 replacing the cut-off disk 310 with a selected burr (cone, cylinder or ball)
15 and used for care and maintenance, particularly in the front portions of
16 the horse's mouth.

17 A flange 411 may be added to the hand piece 402 to provide
18 room for a second channel that functions as a vacuum channel 408.
19 This second channel is fabricated within the handpiece 402 and flange
20 411. An orifice 410 of a preselected shape may be fabricated in the
21 handpiece 402 near the cutting surface of the rotating tool 310. The
22 vacuum channel 408 is fabricated to have one end in communication
23 with the orifice 410 and the other end adapted to be connected to a
24 vacuum source. The vacuum channel 408 provides a hollow pathway
25 starting from the orifice 410 for the removal of debris through the second
26 channel upon connection to a vacuum source. Some segment of the
27 second channel for the vacuum path and the first channel for the shaft
28 within the shaft support may be in common before being bifurcated.
29 Figure 4 D depicts how the flange 411 is held within the handpiece 402
30 with a snug fitting tongue and groove arrangement 412 and kept in place

1 by a set screw 405. In the preferred embodiment the snug fit eliminates
2 the need for a gasket to maintain sufficient vacuum differential to suck
3 out dust and debris.

4 Figure 5 (originally only referred to Figure 5 that had an A, B
5 and C but to clarify the specification was modified to reflect what was
6 labeled on the figure having a A, a B and a C) A, B and C depicts a hand
7 piece generally designated 401 fabricated according to the teachings of
8 this invention. The arrangement illustrated in Fig. 5 (as above, originally
9 only referred to Figure 5) A, B and C is shaped and sized for
10 maintenance of the incisor teeth of the horse. The exposed portion of the
11 cutting surface 302 is minimized by fabricating the outer capped top 402
12 of the handpiece 401 to be close fitting and encircling a large portion of
13 the cutting surface 302. This minimizes the opportunity for the fleshy
14 parts of the horse's mouth to become entangled between the cutting
15 surface 302 and the handpiece 401. The edges 414 of the hand piece
16 401 below the cutting surface 303 are shaped to provide a smooth
17 slightly curved surface that slips smoothly over the teeth and allows the
18 exposed cutting surface to be forcibly pressed against the selected area
19 of the tooth with minimal, non-interfering contact of the hand piece 401
20 with the teeth.

21 The close fitting of the cutting surface to the handpiece 401
22 is achieved in the preferred embodiment by fabricating the base 415 of
23 the handpiece 401 as illustrated in Figures 6 F and 6 B. In the preferred
24 embodiment, the base 415 is machined of aluminum bar stock to form a
25 rounded cap 416 on one end and access channel 417 open on the other
26 end. Wall 407 is shaped to form an encircling guard around a portion of
27 the cutting surface thereby exposing only a selected portion of the
28 cutting surface near the rounded cap 416. Wall 407 extends away from
29 the rounded cap 416 and toward the access channel 417 to form a first
30 channel for the shaft 303 mounted within the shaft support sleeve 304

1 as illustrated in Fig 10. This shaft channel is bifurcated below the
2 exposed cutting surface to communicate with a second channel 408,
3 which is part of the vacuum path. Second wall 409 forms an orifice 410
4 near the cutting surface. A flange mount 418 is formed as shown in
5 Fig. 6 B as a grooved opening wherein the flange 411 may be mounted.
6 The flange 411 illustrated in Figures 7 F and 7 B is a support for a
7 hollow tube 420 one end of the tube 420 communicating with the
8 vacuum channel 408 and the other end extending beyond the flange 411
9 and attachable to a vacuum source. The edges 419 formed around the
10 periphery of the flange 411 are shaped as a tongue surface engagable
11 with the groove formed in the periphery of the flange mount 418 making
12 a snug fitting tongue and groove arrangement 412, snug enough to
13 prevent dissipation of the vacuum pressure so as to not decrease the
14 suction of dust and debris from inside the mouth of the horse passing
15 along the path from the orifice 410 through the vacuum channel 408
16 and hollow tube 420 to the vacuum source, a SHOP VAC ® with
17 appropriate hoses 431 similar to that illustrated in Figure 6 H. The
18 vacuum hoses 431 which join the end of the hollow tube 420 to the
19 vacuum source may be tied to the powered flexible shaft so that as the
20 user moves the hand piece, the line providing the rotational power and
21 the line providing the vacuum source move with the hand piece as a
22 unit.

23 A latch 413 may be mounted in the base 415 at a position to
24 engage a catch mounted on the flexible shaft to secure the flexible shaft
25 with the base 415.

26 Figure 8 is a cross section of the base 415 with flange 411
27 mounted therein by the tongue and groove 412.

28 Figure 9 is a cross section of the base 415 with flange 411
29 installed. A third wall forms a bearing support channel 421 starting

1 near this position and extending in the direction of the rounded cap 416
2 until it intersects with wall 407.

3 Figure 10 illustrates a bearing support sleeve 304 with a
4 bearing 305 and upper shaft seal 306 mounted within one end.

5 To assemble the arrangement, a selected tool comprised of a
6 cutting surface 302 and shaft 303 is inserted through the base 415
7 starting at guard 407 and then into the bearing support channel 421.
8 The bearing support sleeve 304 is then inserted into the bearing support
9 channel 421 engaging the shaft 303 through the bearing 305 so that the
10 shaft 303 extends beyond the end of the bearing support sleeve 304
11 remote from the bearing. The bearing support sleeve 304 is secured in
12 place within the bearing support channel 421 by setscrews 405. Now
13 referring to Figure 5 C, a connector 311 being first mounted to an
14 adapter to a flexible shaft 312, is mounted on the extended end of the
15 shaft 303. The adapter 312 being secured in place by a setscrew 405.

16 Figure 11F illustrates the base 415 of an extended
17 arrangement sized for reaching the rear molars inside the horse's mouth
18 and fabricated according to the teaching of the invention. In the
19 preferred arrangement, the base 415 is 14 inches long. This additional
20 length requires the shaft 303 attached to the cutting surface 302, the
21 bearing support sleeve 304, flange 411, and hollow tube 420 illustrated
22 in Fig. 11, to also be proportionally longer. These items may be extended
23 as illustrated in Figure 11 E. A connector 311 attaches shaft extension
24 313 to the shaft 303 of the cone shaped cutting surface 302.

25 An additional setscrew 405 may be used to secure the longer
26 bearing support sleeve 304. The orifice 410 formed by wall 409 at the
27 front end of the vacuum channel 408 remains similar as it is sized in
28 relationship to the cutting surface 302.

29 Figures 12 (originally used 12F and 12B and tried to correct
30 problem by using 12 FRONT and 12 BACK but did not fix the issue so

1 changed to the X, Y and Z) X, Y and Z illustrate the assembled extended
2 arrangement having a base 415 approximately 14 inches long supporting
3 a rotary tool having a cutting surface 302 and shaft 303 mounted within
4 a bearing support sleeve 304. A connector 311 with adapter to flexible
5 shaft 312 is mounted on the end of the shaft 303 remote from the
6 cutting surface 302.

7 Because the back of the horse mouth is surrounded by
8 fleshy material, the rounded cap 416 of the base 415 may provide
9 inadequate separation between the cutting surface 302 and the fleshy
10 material. An external guard 406 may be mounted on the base 415 to
11 enhance the separation of the fleshy material from the cutting surface
12 302. Posts 422 are mounted near the cutting surface 302. Figures 12
13 A, B and C illustrate three shapes, left, right and balanced , respectively
14 of a type of extended guard 406 which may be removably attached to the
15 base 415 to provide extra separation between the fleshy material and the
16 cutting surface 302. Each extended guard 406 is fabricated with walls
17 423 forming holes engagable with the posts 422. Wall 424 forms an
18 opening to expose the cutting surface 302 and wall 425 forms an
19 opening communicating with the orifice 410. Wall 426 forms a shallow
20 channel in the base 415 into which the lower edge 427 of the extended
21 guard 406 may be inserted. Wall 431 forms a retaining hole in each
22 side of the base 415. A wedge arrangement 428 having an offset head
23 429 and a pin 430 is insertably removable by pin 430 into a selected
24 retaining hole 431 whereby the wedge arrangement 428 is rotated by
25 handle 432 to a position wedging the extended guard 406 securely into
26 place by means of the offset head 429.

27 An attachable handle generally designated 501 is illustrated
28 by Figure 13. This handle may be mounted on the remote end of the 14
29 inch base 415 like a pistol grip to provide a leveraged advantage
30 especially for inserting and guiding the extended arrangement assembled

1 to the rear molars for removing tooth material. This handle incorporates
2 a clamp 502 removably mountable over the end of the base 415 to a
3 position remote from the cap 416. Walls 503 form a threaded hole in the
4 clamp 502 that accepts an extended screw 504 which upon being
5 threaded into threaded hole 503 secures the handle 501 in place as well
6 as preventing movement of clamp 502.

7 Other arrangements that are especially useful for the care of
8 the rear molars is illustrated in Figure 15, the base 415 providing
9 support for the shaft 303 within bearing support sleeve 304, all similar
10 to the above embodiments but a set of gears 428 are mounted on the
11 shaft 303 to change the profile of the shaft 303 by ninety degrees. This
12 embodiment is particularly useful with the cut-off disk 310 mounted
13 therein in a position which is essentially horizontal. The cut-off disk can
14 be easily positioned to score a portion of a tooth to be chipped off or used
15 to polish and smooth selected teeth even in the rear portions of the
16 horse's mouth.

17 The arrangement illustrated in Figure 14 (B) is fabricated
18 according to the above teaching but incorporates a set of gears (428) 429
19 mounted within the base 415. The gears 429 are adapted to change the
20 rotational motion of the shaft 303 to a reciprocating motion. In the
21 preferred embodiment, the reciprocating motion is approximately 1/4
22 inch back and forth. A tool pad (430) 453 is removably attachable to a
23 reciprocating tool handle (429). The tool pad (430) 453 has a flat cutting
24 surface and is particularly useful for the care and maintenance of the
25 rear most molars in the horse's mouth. The hand piece 415 may be
26 pistol shaped to supply leverage and to provide adequate mounting for
27 the set of gears 428 within the hand piece 415 at a point that is not
28 inserted into the mouth of the horse.

29 The units in the preferred embodiment are fabricated of a
30 preselected material such as aluminum, chosen to be lightweight,

1 strong, easily machined and able to function in a wet environment. The
2 surface of the aluminum may be anodized to protect the material from
3 corrosion. A lightweight urethane material is preferred for the slip on
4 extended guard 406 shown in Figure 1 C.

5 Figure (originally misidentified as Figure 18 then changed
6 but incorrectly to Figure 6 when it should have been Figure 16)16 is a
7 schematic representation of the power train generally designated 201.
8 The basic configuration is a selected motor 101. The tools may be
9 mounted directly onto the shaft of the motor 101 or separated from the
10 motor 101 by a flexible shaft 204 as discussed above. Both
11 configurations provide a direct connection between the motor 101 and
12 the cutting surface 302 of the tool. In the preferred embodiment of the
13 power train 201, an adjustable torque clutch 206 is included. Should
14 the preselected torque of the clutch 206 be exceeded during use of the
15 arrangement fabricated according to the teachings of this invention, the
16 clutch 206 will disengage the powered motion of the motor 101 from the
17 tool thereby minimizing possible injury to the horse or user and allow
18 the user to safely clear any obstruction of the arrangement before
19 continuing use.

20 Figure 17 illustrates a clutch 206 having a set of clutch
21 plates 207, a torque adjustment knob 208 that sets the tension between
22 the clutch plates 207. An end adapter 209 compatible with the flexible
23 shaft 204 is mounted on the clutch 206 remote from the motor 101. The
24 clutch 206 is mounted within the collet 202 of the motor 101.

25 A clutch housing 210 is fabricated to slip over the clutch
26 206 and onto the motor 101 to a position whereby the end adapter 209
27 is engagable by the end of the flexible shaft 204 which is mounted within
28 the clutch housing 210. A sliding window 211 may be mounted on the
29 clutch housing 210 to allow easy access by the user to the torque
30 adjustment knob 208.

1 Figure (originally misidentified as Figure 18 but should have
2 been Figure 16) 16 illustrates a collar 212 fabricated from stainless steel
3 and mounted on the flexible shaft 204 remote from the end of the flexible
4 shaft mounted to the clutch housing 210. The collar 212 is fabricated
5 with a catch 213 engagable by the latch 413 mounted on the base 415 of
6 the hand piece 401 when the collar 212 is inserted within access
7 channel (originally misidentified so clarified by changes the number to
8 417) 417. The rotational motion of the motor 101 is selectively,
9 interruptably transmitted to the clutch 206, through the flexible shaft
10 204 engagable with the flexible shaft adapter 312 to the cutting surface
11 302.

12 Since certain change may be made in the above apparatus
13 without departing from the scope of the invention herein involved, it is
14 intended that all matter contained in the above description, as shown in
15 the accompanying drawing, shall be interpreted in an illustrative, and
16 not a limiting sense.

1 WHAT IS CLAIMED IS:

- 2 1. (Cancelled) An arrangement of a tool insertable into the mouth of a
3 house for the care and maintenance of teeth while providing
4 protection of soft tissue within the mouth of the horse and comprising
5 in combination:
6 an electric rotary motor having a means to hold said tool along the axis
7 of rotation of said motor, said tool having a tooth cutting surface of
8 a preselected size and shape;
9 a shaft having one end mounted to said cutting surface and the other
10 end attachable to said motor holding means thereby supplying
11 rotational motion to said tool;
12 a shaft support means through which said shaft may be removably
13 inserted;
14 a hand piece having a channel through which said shaft support means
15 is removably insertable; and,
16 a cutting surface guard fabricated as a portion of said hand piece and
17 shaped to be in encircling relation about a selected portion of said
18 cutting surface thereby exposing only a portion of said cutting
19 surface under the condition of said shaft support means, having
20 said shaft inserted therein, is mounted within said shaft support
21 channel of said hand piece and said shaft engaged within said
22 holding means thereby allowing a user of the arrangement to guide
23 said hand piece containing the partially guarded tool into the
24 mouth of the horse to separate said soft tissue from a preselected
25 portion of a tooth with said cutting surface guard and position the
26 unguarded portion of said cutting surface against a tooth to remove
27 a selection portion of said tooth by means of said tool in rotary
28 motion.

29

- 1 2. (rewritten to include all of the limitations of claim 1) The arrangement
2 defined in claim 1 wherein said shaft support means further
3 comprises a bearing mounted at a preselected position within said
4 shaft support means and a bearing seal mounted at a position
5 between said bearing and said cutting surface through which said
6 shaft may be inserted and supported for rotary motion without
7 binding.
8
- 9 3. The arrangement defined in claim 2 further comprising a brass sleeve
10 mountable around said shaft under the condition of said shaft being
11 inserted through said bearing and bearing seal into said shaft
12 support means, said brass sleeve providing separation between said
13 shaft and said shaft support means.
14
- 15 4. (Cancelled) The arrangement defined in claim 1 further comprising a
16 flexible shaft having one end adaptively mountable to said motor
17 thereby supplying rotational motion to said flexible shaft and the
18 other end having a means to hold said tool along the axis of rotation
19 of the flexible shaft thereby separating said motor from said tool so
20 that said motor may be supported at a position remote from said tool.
21
- 22 5. (Cancelled) The arrangement defined in claim 1 further comprising
23 preselected sized and shaped extended guards mountable to said
24 cutting surface guard to provide additional separation between said
25 cutting surface and said soft tissue within the mouth of the horse.
26
- 27 6. (Cancelled) The arrangement defined in claim 1 wherein said hand
28 piece further comprises an orifice formed near said cutting surface
29 and a second channel one end in communication with said orifice,
30 the other end adapted to be removably attachable to a vacuum source

1 whereby the dust and debris created by the removal of a selected
2 portion of a tooth may first enter said orifice and then said second
3 channel to be sucked out of the mouth of the horse and deposited
4 into said vacuum source.

5

6 7. The arrangement in claim 2 wherein said shaft support means further
7 comprises gearing means mounted within said shaft support means
8 and in communication with said shaft to change the rotational
9 motion of said shaft attached to said motor holding means into
10 reciprocating motion which may be applied to said cutting surface
11 mounted on said shaft remote from said gearing means.

12

13 8. The arrangement in claim 2 wherein said shaft support means further
14 comprises gearing means mounted within said shaft support means
15 and in communication with said shaft to change the profile of the
16 shaft by a preselected angle thereby increasing the range of
17 placement of said cutting surface of said tool.

18

19 9. (Cancelled) The arrangement in claim 4 wherein said adaptive
20 mounting of said flexible shaft is to a motor owned by the user.

21

22 10. (Cancelled) The arrangement in claim 4 wherein said means to hold
23 said tool is a handle owned by the user, said flexible shaft having
24 means to adaptively mount said handle on the end of said flexible
25 shaft under the condition of said shaft mounted within said handle.

26

27 11. (Cancelled) The arrangement in claim 4 further comprising a clutch
28 mounted with one end in communication with said motor and
29 another end remote from said motor in communicated with said
30 flexible shaft thereby providing interruptible transmission of motion

1 from said motor to said cutting surface in communication with said
2 flexible shaft.

3

4 12. The arrangement in claim 11 wherein said clutch further comprises
5 means to adjust the threshold of torque at which said motion is
6 interrupted.

7

8 13. The arrangement in claim 12 further comprising a clutch housing
9 mountable to said motor thereby enclosing said clutch and having a
10 mounting to retain one end of said flexible shaft in communication
11 with said clutch, said clutch housing having an means for access by
12 the user to the means to adjust the torque.

13

14 14. (Cancelled) The arrangement in claim 1 wherein said hand piece and
15 guard are fabricated from aluminum.

16

17 15. (Cancelled) The arrangement in claim 14 wherein the exposed
18 surfaces of said aluminum are anodized.

19

20 16. An electric motor powered arrangement insertable into the mouth of
21 a horse for the care and maintenance of equine teeth while providing
22 protection of soft tissue within the mouth of the horse and
23 comprising in combination:

24 a tool having a tooth material removal surface;

25 a shaft having a first end mounted to said tool and a second end
26 attachable to said electric motor whereby said tooth material
27 removal surface has a powered motion;

28 a hand piece fabricated with an internal shaft channel;

29 a bearing support sleeve;

1 at least one bearing mounted within said support sleeve at a
2 preselected position whereby said bearing accepts the insertion of
3 said shaft through said bearing thereby exposing the end of said
4 shaft remote from said tooth removal surface, said bearing support
5 sleeve mounted with said internal shaft channel whereby said
6 exposed end of said shaft is attachable to said electric motor, said
7 bearing providing support for said shaft under the condition of said
8 tooth material removal surface tool being guided into contact with a
9 preselected tooth and pressed against the tooth until a preselected
10 portion of the tooth is removed while said tooth material removal
11 surface is under powered motion;
12 a protective shield fabricated as part of said hand piece at a
13 preselected position and shaped to expose a preselected portion of
14 said tooth material removal surface of said tool retained within said
15 hand piece, said exposed portion guided into contact with a
16 preselected portion of the tooth whereby the remaining non-exposed
17 surface is separated from other portions of the horses mouth
18 including said soft tissue; and,
19 a sleeve mountable over said shaft within said shaft hand piece
20 whereby said sleeve provides additional bearing means between said
21 shaft and said hand piece without binding.

22
23 17. The arrangement defined in claim 16 wherein said bearing support
24 sleeve means further comprises a bearing mounted at a preselected
25 position within said bearing support sleeve and a bearing seal
26 mounted at a position between said bearing and said cutting surface
27 through which said shaft may be inserted and supported for rotary
28 motion without binding.

29

- 1 18. The arrangement defined in claim 16 further comprising a flexible
2 shaft having one end adaptively mountable to said motor thereby
3 supplying rotational motion to said flexible shaft and the other end
4 having a means to hold said tool along the axis of rotation of the
5 flexible shaft thereby separating said motor from said tool so that
6 said motor may be supported at a position remote from said tool.
7
- 8 19. The arrangement defined in claim 16 further comprising preselected
9 sized and shaped extended guards mountable to said cutting
10 surface guard to provide additional separation between said cutting
11 surface and said soft tissue within the mouth of the horse.
12
- 13 20. The arrangement defined in claim 19 wherein said extended guard
14 further comprises an orifice formed near said cutting surface and a
15 vacuum channel one end of which is in communication with said
16 orifice, the other end of said vacuum channel adapted to be
17 removably attachable to a vacuum source whereby the dust and
18 debris created by the removal of a selected portion of a tooth may
19 first enter said orifice and then said channel to be sucked out of the
20 mouth of the horse and deposited into said vacuum source.
21
- 22 21. The arrangement in claim 16 wherein said bearing support sleeve
23 further comprises gearing means mounted within said bearing
24 support sleeve and in communication with said shaft to change the
25 rotational motion of said shaft attached to said motor holding means
26 into reciprocating motion which may be applied to said cutting
27 surface mounted on said shaft remote from said gearing means.
28
- 29 22. The arrangement in claim 16 wherein said bearing support sleeve
30 further comprises gearing means mounted within said bearing

1 support sleeve and in communication with said shaft to change the
2 profile of the shaft by a preselected angle thereby increasing the
3 range of placement of said cutting surface of said tool.

4
5 23. The arrangement in claim 18 wherein said adaptive mounting of
6 said flexible shaft is to a motor owned by the user.

7
8 24. The arrangement in claim 18 wherein said means to hold said tool is
9 a handle owned by the user, said flexible shaft having means to
10 adaptively mount said handle on the end of said flexible shaft under
11 the condition of said shaft mounted within said handle.

12
13 25. The arrangement in claim 18 further comprising a clutch mounted
14 with one end in communication with said motor and another end
15 remote from said motor in communicated with said flexible shaft
16 thereby providing interruptible transmission of motion from said
17 motor to said cutting surface in communication with said flexible
18 shaft.

19
20 26. The arrangement in claim 25 wherein said clutch further comprises
21 means to adjust the threshold of torque at which said motion is
22 interrupted.

23
24 27. The arrangement in claim 26 further comprising a clutch housing
25 mountable to said motor thereby enclosing said clutch and having a
26 mounting to retain one end of said flexible shaft in communication
27 with said clutch, said clutch housing having an means for access by
28 the user to the means to adjust the torque.

29

- 1 28. The arrangement in claim 16 wherein said hand piece and guard are
2 fabricated from aluminum.
3
- 4 29. The arrangement in claim 28 wherein the exposed surfaces of said
5 aluminum are anodized.

1 ABSTRACT OF THE DISCLOSURE

2 An arrangement that may be used in combination with
3 selected tools having a tooth cutting surface for the care and
4 maintenance such as removing a selected portion of the exposed surface
5 of equine teeth. The selected tool in communication with a source of
6 powered motion and mounted in and supported by a hand piece which is
7 guided into the mouth of the horse. The cutting surface of the powered
8 tool is partially guarded so as to protect fleshy portions of the horse's
9 mouth from being engaged by the cutting surface. The hand piece
10 provides for quick on and off attachment of a selected cutting surface for
11 maintenance of a preselected portion of teeth within the same hand
12 piece or another hand piece sized to ease access to the next selected
13 portion of the horse's mouth. The selected hand piece arrangement may
14 further incorporate a vacuum channel whereby the tooth dust and
15 debris created by the powered cutting surface removing a portion of
16 tooth is sucked out of the mouth of the horse. The motion of the tooth
17 surface removal tool may be changed from rotary to powered
18 reciprocating motion for a selected portion of the teeth or changed to be
19 at a preselected angle. Attaching the powered drive to the rotary cutting
20 surface by means of an adjustable clutch further enhances protection
21 from injury to the inside of the mouth of the horse.